http://www.epa.gov/ozone/defns.html
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Ozone Layer Protection

Ozone Layer Protection Glossary

In order to understand information about ozone depletion, it is important to know several terms and acronyms. We've listed them below.

Aerosol:

1) a small droplet or particle suspended in the atmosphere, typically containing sulfur

Aerosols are emitted naturally (e.g., in volcanic eruptions) and as the result of human activities (e.g., by burning fossil fuels). There is no connection between particulate aerosols and pressurized products also called aerosols (see below).

2) a product that relies on a pressurized gas to propel substances out of a container

Consumer aerosol products in the US have not used ozone-depleting substances (ODS) since the late 1970s because of voluntary switching followed by federal regulation. The Clean Air Act and EPA regulations further restricted the use of ODS for non-consumer products. All consumer products, and most other aerosol products, now use propellants that do not deplete the ozone layer, such as hydrocarbons and compressed gases.

Return to Previous Page

Carbon Tetrachloride (CCl4): a compound consisting of one carbon atom and four chlorine atoms

Carbon tetrachloride was widely used as a raw material in many industrial uses, including the production of chlorofluorocarbons (CFCs), and as a solvent. Solvent use ended when it was discovered to be carcinogenic. It is also used as a catalyst to deliver chlorine ions to certain processes. Its ozone depletion potential is 1.2.

Return to Previous Page

Chlorofluorocarbon (CFC): a compound consisting of chlorine, fluorine, and carbon

CFCs are very stable in the troposphere. They move to the stratosphere and are broken down by strong ultraviolet (UV) light, where they release chlorine atoms that then deplete the ozone layer. CFCs are commonly used as refrigerants, solvents, and foam blowing agents. The most common CFCs are CFC-11, CFC-12, CFC-113, CFC-114, and CFC-115. The ozone depletion potential (ODP) for each CFC is, respectively, 1, 1, 0.8, 1, and 0.6. A table of all ozone-depleting substances shows their ODPs, global warming potentials (GWPs), and CAS numbers. CFCs are numbered according to a standard scheme.

Return to Previous Page

Class I Substance: one of several groups of chemicals with an ozone-depletion potential of 0.2 or higher

Class I substances listed in the Clean Air Act (CAA) include CFCs, halons, carbon tetrachloride, and methyl chloroform. EPA later added HBFCs and methyl bromide to the list by regulation. A table of class I substances shows their lifetime ODPs, GWPs, and CAS numbers.

Return to Previous Page

Class II Substance: a chemical with an ozone-depletion potential of less than 0.2

Currently, all of the HCFCs are class II substances. Lists of class II substances with their ODPs, GWPs, and CAS numbers are available.

Return to Previous Page

Clean Air Act (CAA): law amended by Congress in 1990

Title VI of the CAA directs EPA to protect the ozone layer through several regulatory and voluntary programs. Sections within Title VI cover production of ozone-depleting substances (ODS), the recycling and handling of ODS, the evaluation of substitutes, and efforts to educate the public.

Return to Previous Page

Column Ozone: ozone between the Earth's surface and outer space

Ozone levels can be described in several ways. One of the most common measures is how much ozone is in a vertical column of air. The Dobson unit is a measure of column ozone. Other measures include partial pressure, number density, and concentration of ozone, and can represent either column ozone or the amount of ozone at a particular altitude.

Return to Previous Page

Dobson Unit (DU): a measurement of column ozone levels

If 100 DU of ozone were brought to the Earth's surface, it would form a layer 1 millimeter thick. In the tropics, ozone levels are typically between 250 and 300 DU year-round. In temperate regions, seasonal variations can produce large swings in ozone levels. For instance, measurements in Leningrad have recorded ozone levels as high as 475 DU and as low as 300 DU. These variations occur even in the absence of ozone depletion, but they are well understood. Ozone depletion refers to reductions in ozone below normal levels after accounting for seasonal cycles and other natural effects. For a graphical explanation, see NASA's TOMS site.

Return to Previous Page

Global Warming Potential (GWP): a number that refers to the amount of global warming caused by a substance

The GWP is the ratio of the warming caused by a substance to the warming caused by a similar mass of carbon dioxide. Thus, the GWP of CO2 is defined to be 1.0 . CFC-12 has a GWP of 8,500, while CFC-11 has a GWP of 5,000. Various HCFCs and HFCs have GWPs ranging from 93 to 12,100. Water, a substitute in numerous end-uses, has a GWP of 0. A table of all ozone-depleting substances shows their ODPs, GWPs, and CAS numbers, and another table shows the GWPs for many non-ozone-depleting substances.

Return to Previous Page

Halon: a compound consisting of bromine, fluorine, and carbon

Halons are used as fire extinguishing agents, both in built-in systems and in handheld portable fire extinguishers. Halon production in the U.S. ended on December 31, 1993, because they contribute to ozone depletion. They cause ozone depletion because they contain bromine. Bromine is many times more effective at destroying ozone than chlorine. At the time the current U.S. tax code was adopted, the ozone depletion potentials of halon 1301 and halon 1211 were observed to be 10 and 3, respectively. These values are used for tax calculations. Recent scientific studies, however, indicate that the ODPs are at least 12 and 6, respectively. Note: technically, all compounds containing carbon and fluorine and/or chlorine are halons, but in the context of the Clean Air Act, "halon" means a fire extinguishing agent as described above. A table of class I substances shows their ODPs, GWPs, and CAS numbers. Halons are numbered according to a standard scheme.

Return to Previous Page

Heel:

A "heel," as defined in 40 CFR 82.3, is the residual amount of a substance that remains in a container after it is discharged or offloaded. A "heel" can be no more than ten percent of the volume of the container. The person importing the heel must certify that the residual amount will remain in the container and be included in a future shipment, or be recovered for transformation, destruction, or a non-emissive purpose.

Return to Previous Page

Hydrobromofluorocarbon (HBFC): a compound consisting of hydrogen, bromine, fluorine, and carbon

Although they were not originally regulated under the Clean Air Act, subsequent regulation added HBFCs to the list of class I substances. A table of class I substances shows their ODPs, GWPs, and CAS numbers.

Return to Previous Page

Hydrocarbon (HC): a compound consisting of carbon and hydrogen

Hydrocarbons include methane, ethane, propane, cyclopropane, butane, and cyclopentane. Although they are flammable, HCs may offer advantages as substitutes to ozone depleting substances because they have zero ozone depletion potential, low toxicity, and with the exception of methane, have low global warming potential (GWP). HCs are numbered according to a standard scheme.

Return to Previous Page

Hydrochlorofluorocarbon (HCFC): a compound consisting of hydrogen, chlorine, fluorine, and carbon

The HCFCs are one class of chemicals being used to replace the CFCs. They contain chlorine and thus deplete stratospheric ozone, but to a much lesser extent than CFCs. HCFCs have ozone depletion potentials (ODPs) ranging from 0.01 to 0.1. Production of HCFCs with the highest ODPs are being phased out first, followed by other HCFCs. A table of ozone-depleting substances shows their ODPs, GWPs, and CAS numbers. HCFCs are numbered according to a standard scheme.

Return to Previous Page

Hydrofluorocarbon (HFC): a compound consisting of hydrogen, fluorine, and carbon

The HFCs are a class of replacements for CFCs. Because they do not contain chlorine or bromine, they do not deplete the ozone layer. All HFCs have an ozone depletion potential of 0. Some HFCs have high GWPs. HFCs are numbered according to a standard scheme.

Return to Previous Page

Methyl Bromide (CH3Br): a compound consisting of carbon, hydrogen, and bromine

Methyl Bromide is an effective pesticide used to fumigate soil and many agricultural products. Because it contains bromine, it depletes stratospheric ozone and has an ozone depletion potential of 0.6. Production of methyl bromide was phased out on December 31, 2004, except for allowable exemptions. Much more information is available.

Return to Previous Page

Methyl Chloroform (CH3CCl3): a compound consisting of carbon, hydrogen, and chlorine

Methyl chloroform is used as an industrial solvent. Its ozone depletion potential is 0.11.

Return to Previous Page

Montreal Protocol: the international treaty governing the protection of stratospheric ozone

The Montreal Protocol on Substances That Deplete the Ozone Layer and its amendments control the phaseout of ODS production and use. Under the Montreal Protocol, several international organizations report on the science of ozone depletion, implement projects to help move away from ODS, and provide a forum for policy discussions. In addition, the Multilateral Fund provides resources to developing nations to promote the transition to ozone -safe technologies. The full text of the Montreal Protocol EXIT Disclaimer is available from the United Nations Environmental Programme (UNEP).

Return to Previous Page

Nanometer: a distance of one billionth of a meter

The nanometer, or nm, is a common unit used to describe wavelengths of light or other electromagnetic radiation such as UV. For example, green light has wavelengths of about 500 -550 nm, while violet light has wavelengths of about 400-450 nm. One billionth is a tiny number. One foot is about one billionth the distance of 48 round-trips between Los Angeles and Washington, DC.

Return to Previous Page

Ozone: a gas composed of three atoms of oxygen

Ozone is a bluish gas that is harmful to breathe. Nearly 90% of the Earth's ozone is in the stratosphere and is referred to as the ozone layer. Ozone absorbs a band of ultraviolet radiation called UVB that is particularly harmful to living organisms. The ozone layer prevents most UVB from reaching the ground.

Return to Previous Page

Ozone-Depleting Substance(s) (ODS): a compound that contributes to stratospheric ozone depletion

ODS include chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), halons, methyl bromide, carbon tetrachloride, hydrobromofluorocarbons, chlorobromomethane, and methyl chloroform. ODS are generally very stable in the troposphere and only degrade under intense ultraviolet light in the stratosphere. When they break down, they release chlorine or bromine atoms, which then deplete ozone. A detailed list of class I and class II substances with their ODPs, GWPs, and CAS numbers are available.

Return to Previous Page

Ozone Depletion: Chemical destruction of the stratospheric ozone layer beyond natural reactions

Stratospheric ozone is constantly being created and destroyed through natural cycles. Various ozone-depleting substances (ODS), however, accelerate the destruction processes, resulting in lower than normal ozone levels. The science page offers much more detail on the science of ozone depletion.

Return to Previous Page

Ozone Depletion Potential (ODP): a number that refers to the amount of ozone depletion caused by a substance

The ODP is the ratio of the impact on ozone of a chemical compared to the impact of a similar mass of CFC-11. Thus, the ODP of CFC-11 is defined to be 1.0. Other CFCs and HCFCs have ODPs that range from 0.01 to 1.0. The halons have ODPs ranging up to 10. Carbon tetrachloride has an ODP of 1.2, and methyl chloroform's ODP is 0.11. HFCs have zero ODP because they do not contain chlorine. A table of all ozone-depleting substances shows their ODPs, GWPs, and CAS numbers.

Return to Previous Page

Ozone layer: the region of the stratosphere containing the bulk of atmospheric ozone

The ozone layer lies approximately 15-40 kilometers (10-25 miles) above the Earth's surface, in the stratosphere. Depletion of this layer by ozone depleting substances (ODS) will lead to higher UVB levels, which in turn will cause increased skin cancers and cataracts and potential damage to some marine organisms, plants, and plastics. The science page offers much more detail on the science of ozone depletion.

Return to Previous Page

Perfluorocarbon (PFC): a compound consisting of carbon and fluorine

PFCs have extremely high global warming potentials (GWPs) and very long lifetimes. They do not deplete stratospheric ozone, but EPA is concerned about their impact on global warming.

Return to Previous Page

Stratosphere: the region of the atmosphere above the troposphere

The stratosphere extends from about 10km to about 50km in altitude. Commercial airlines fly in the lower stratosphere. The stratosphere gets warmer at higher altitudes. In fact, this warming is caused by ozone absorbing ultraviolet radiation. Warm air remains in the upper

stratosphere, and cool air remains lower, so there is much less vertical mixing in this region than in the troposphere.

Return to Previous Page

Transhipments:

Transhipment, as defined in 40 CFR 82.3, is the continuous shipment of a controlled substance (i.e. CFCs), from a foreign state of origin through the United States or its territories, to a second foreign state of final destination, as long as the shipment does not enter into United States jurisdiction. A transhipment, as it moves through the United States or its territories, may not be re-packaged, sorted, or otherwise changed in condition.

Return to Previous Page

Troposphere: the region of the atmosphere closest to the Earth

The troposphere extends from the surface up to about 10 km in altitude, although this height varies with latitude. Almost all weather takes place in the troposphere. Mt. Everest, the highest mountain on Earth, is only 8.8 km high. Temperatures decrease with altitude in the troposphere. As warm air rises, it cools, falling back to Earth. This process, known as convection, means there are huge air movements that mix the troposphere very efficiently.

Return to Previous Page

Used Controlled Substances:

A used Class I or Class II compound has been either recovered from their intended use systems (e.g. chiller, refrigerator, etc) or have been recycled or reclaimed.

Return to Previous Page

UV: ultraviolet radiation

Ultraviolet radiation is a portion of the electromagnetic spectrum with wavelengths shorter than visible light. The sun produces UV, which is commonly split into three bands: UVA, UVB, and UVC. UVA is not absorbed by ozone. UVB is mostly absorbed by ozone, although some reaches the Earth. UVC is completely absorbed by ozone and normal oxygen. NASA provides more information on their web site.

Return to Previous Page

UVA: a band of ultraviolet radiation with wavelengths from 320-400 nanometers produced by the Sun

UVA is not absorbed by ozone. This band of radiation has wavelengths just shorter than visible violet light. NASA provides more information on their web site.

Return to Previous Page

UVB: a band of ultraviolet radiation with wavelengths from 280-320 nanometers produced by the Sun

UVB is a kind of ultraviolet light from the sun (and sun lamps) that has several harmful effects. UVB is particularly effective at damaging DNA. It is a cause of melanoma and other types of skin cancer. It has also been linked to damage to some materials, crops, and marine organisms. The ozone layer protects the Earth against most UVB coming from the sun. It is always important to protect oneself against UVB, even in the absence of ozone depletion, by

wearing hats, sunglasses, and sunscreen. However, these precautions will become more important as ozone depletion worsens. NASA provides more information on their web site.

Return to Previous Page

UVC: a band of ultraviolet radiation with wavelengths shorter than 280 nanometers

UVC is extremely dangerous, but it is completely absorbed by ozone and normal oxygen (O_2). NASA provides more information on their web site.